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JAN 07 2005
PATENT & TRADEMARK OFFICE

FIG. 1A

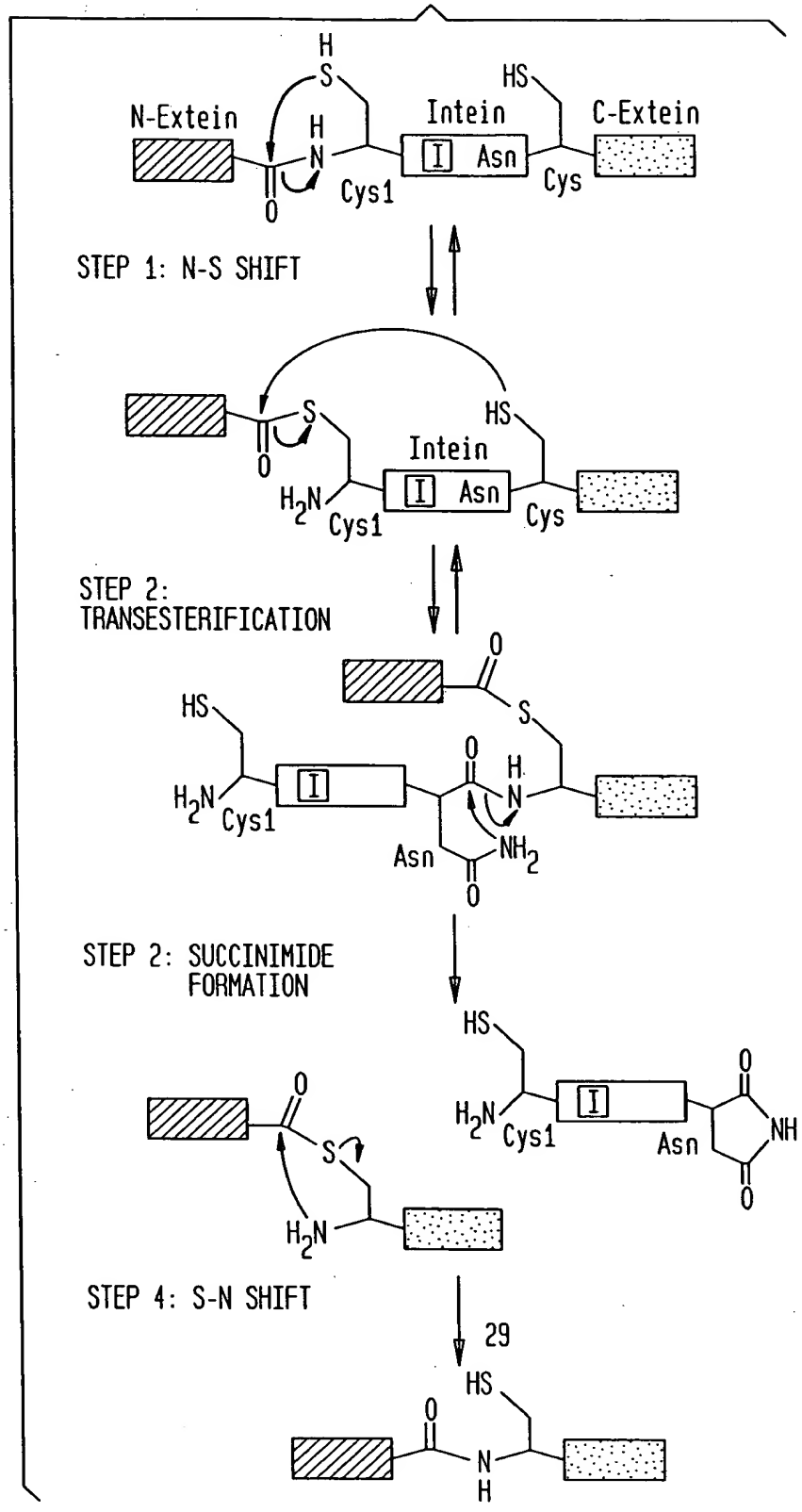

FIG. 1B

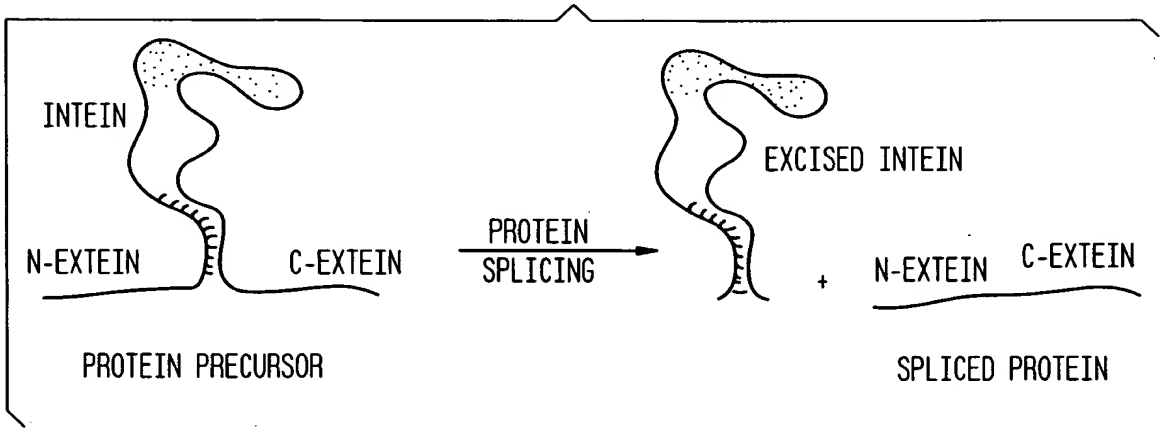
INTEIN
N-EXTEIN
C-EXTEIN
PROTEIN PRECURSOR
PROTEIN SPLICING
EXCISED INTEIN
N-EXTEIN
C-EXTEIN
SPLICED PROTEIN

FIG. 2A

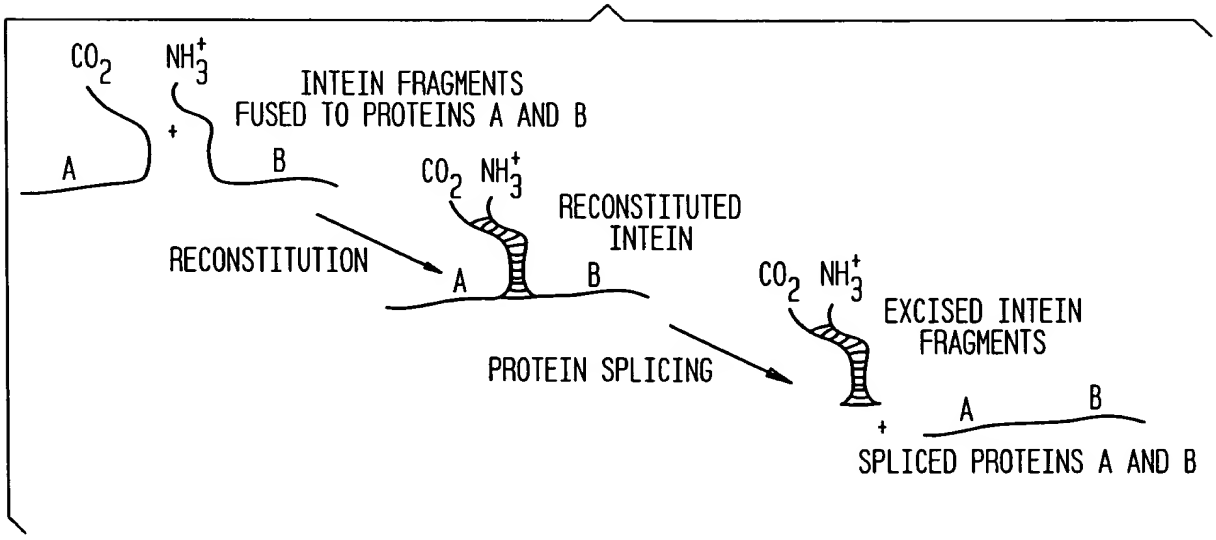
CO_2
NH_3^+
INTEIN FRAGMENTS
FUSED TO PROTEINS A AND B
A
B
RECONSTITUTION
RECONSTITUTED
INTEIN
PROTEIN SPLICING
EXCISED INTEIN
FRAGMENTS
SPLICED PROTEINS A AND B

FIG. 2B

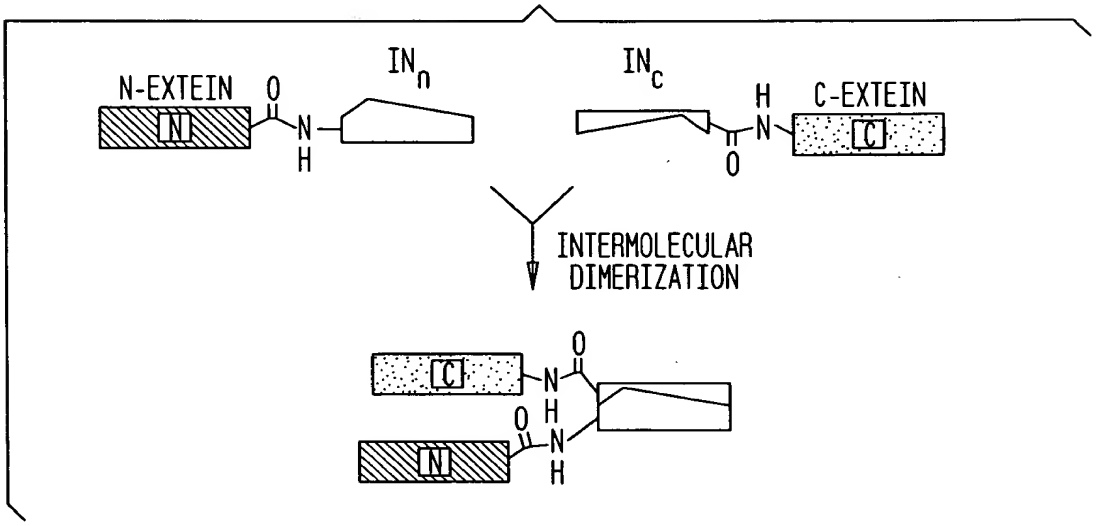
N-EXTEIN
[N]
O
N
H
IN$_n$
IN$_c$
H
N
O
C-EXTEIN
[C]
INTERMOLECULAR
DIMERIZATION
[C]
O
N
H
O
H
N
[N]

FIG. 3

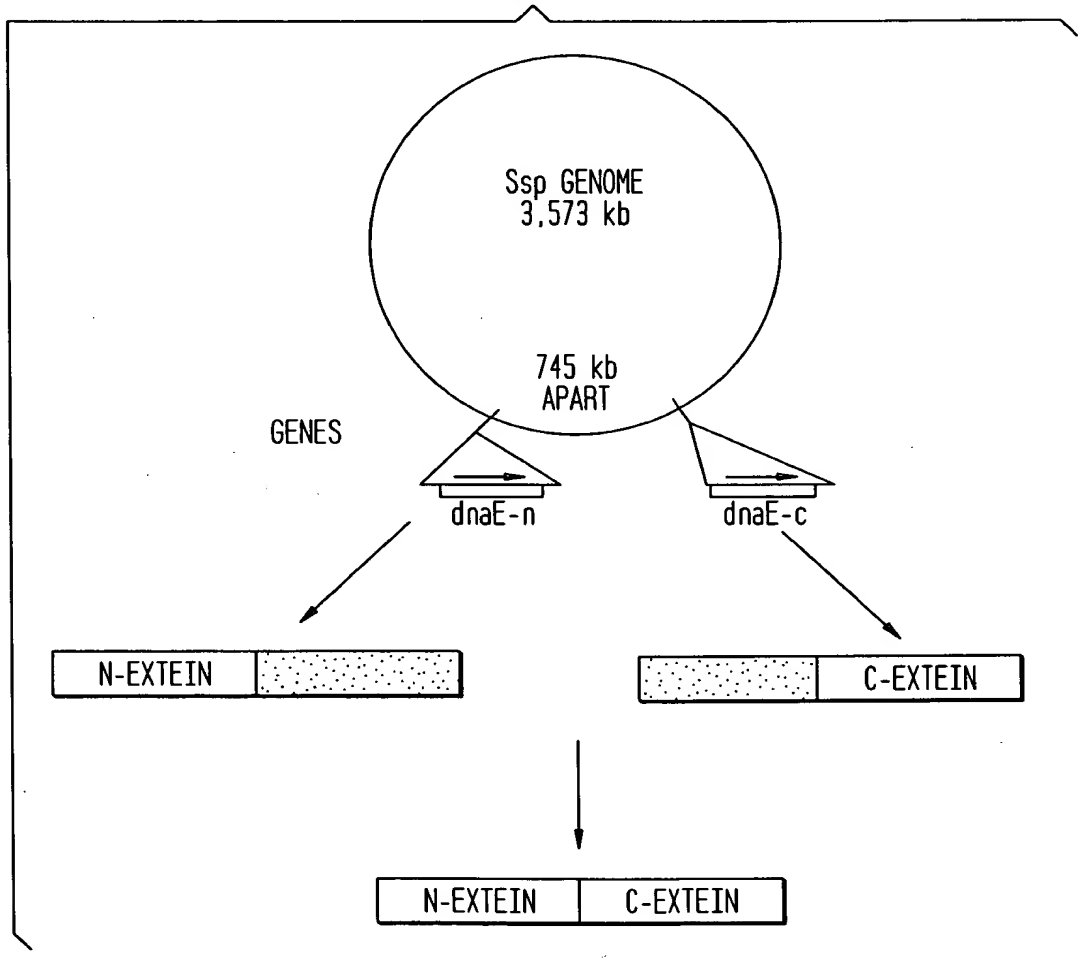
Ssp GENOME
3,573 kb
745 kb
APART
GENES
dnaE-n
dnaE-c
N-EXTEIN
C-EXTEIN
N-EXTEIN
C-EXTEIN

FIG. 4A

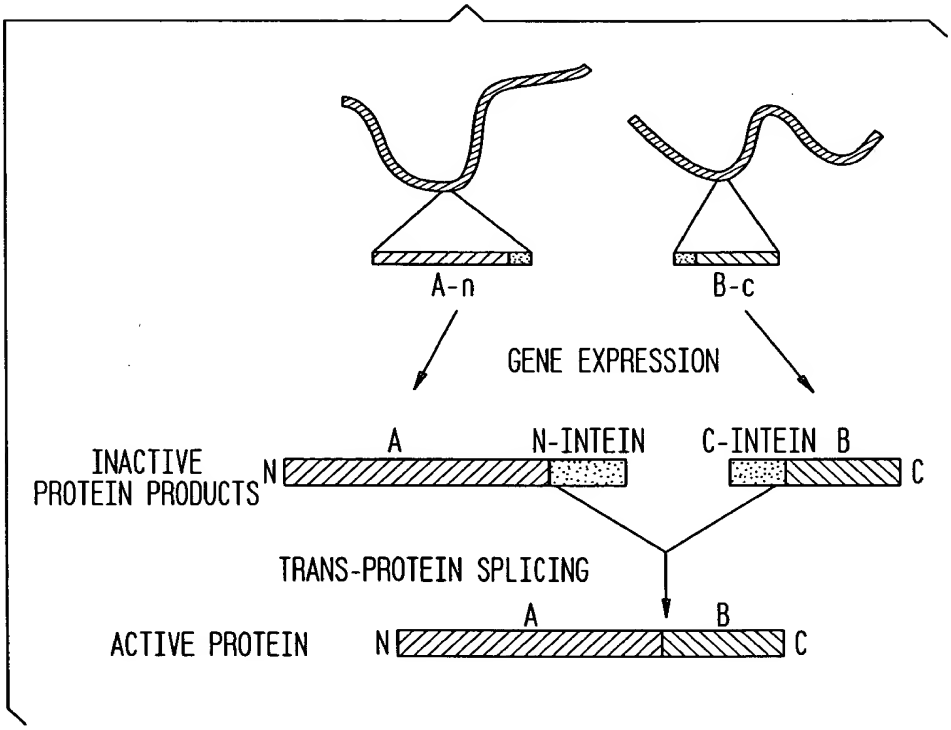
A-n
B-c
GENE EXPRESSION
A
N-INTEIN
C-INTEIN
B
INACTIVE
PROTEIN PRODUCTS
N
C
TRANS-PROTEIN SPLICING
A
B
ACTIVE PROTEIN
N
C

FIG. 4B

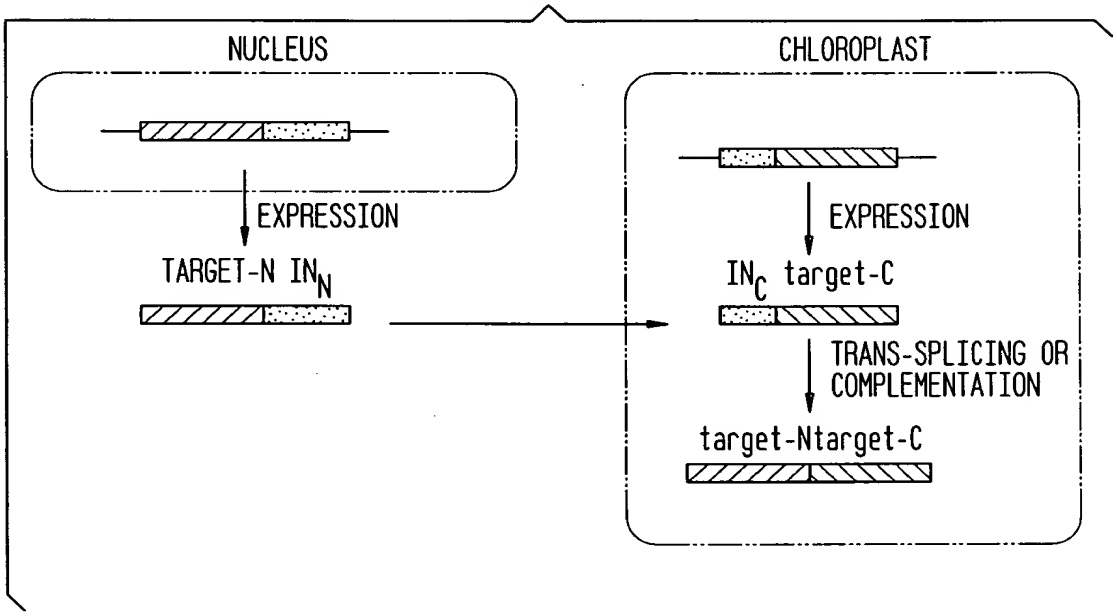
NUCLEUS
CHLOROPLAST
EXPRESSION
TARGET-N IN$_N$
EXPRESSION
IN$_C$ target-C
TRANS-SPLICING OR
COMPLEMENTATION
target-Ntarget-C

FIG. 5

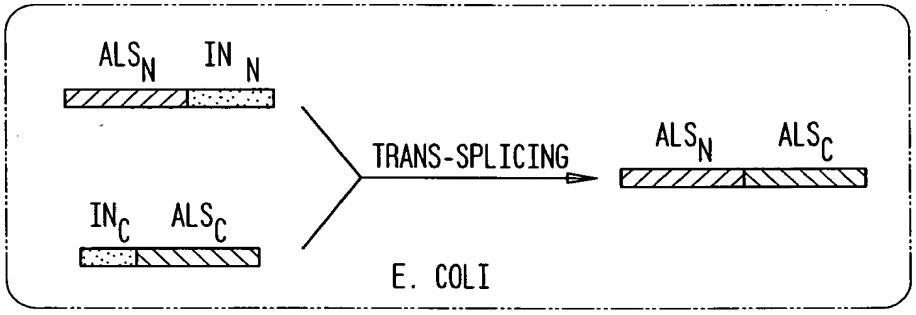
ALS$_N$ IN $_N$
IN$_C$ ALS$_C$
TRANS-SPLICING
ALS$_N$ ALS$_C$
E. COLI

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FIG. 6

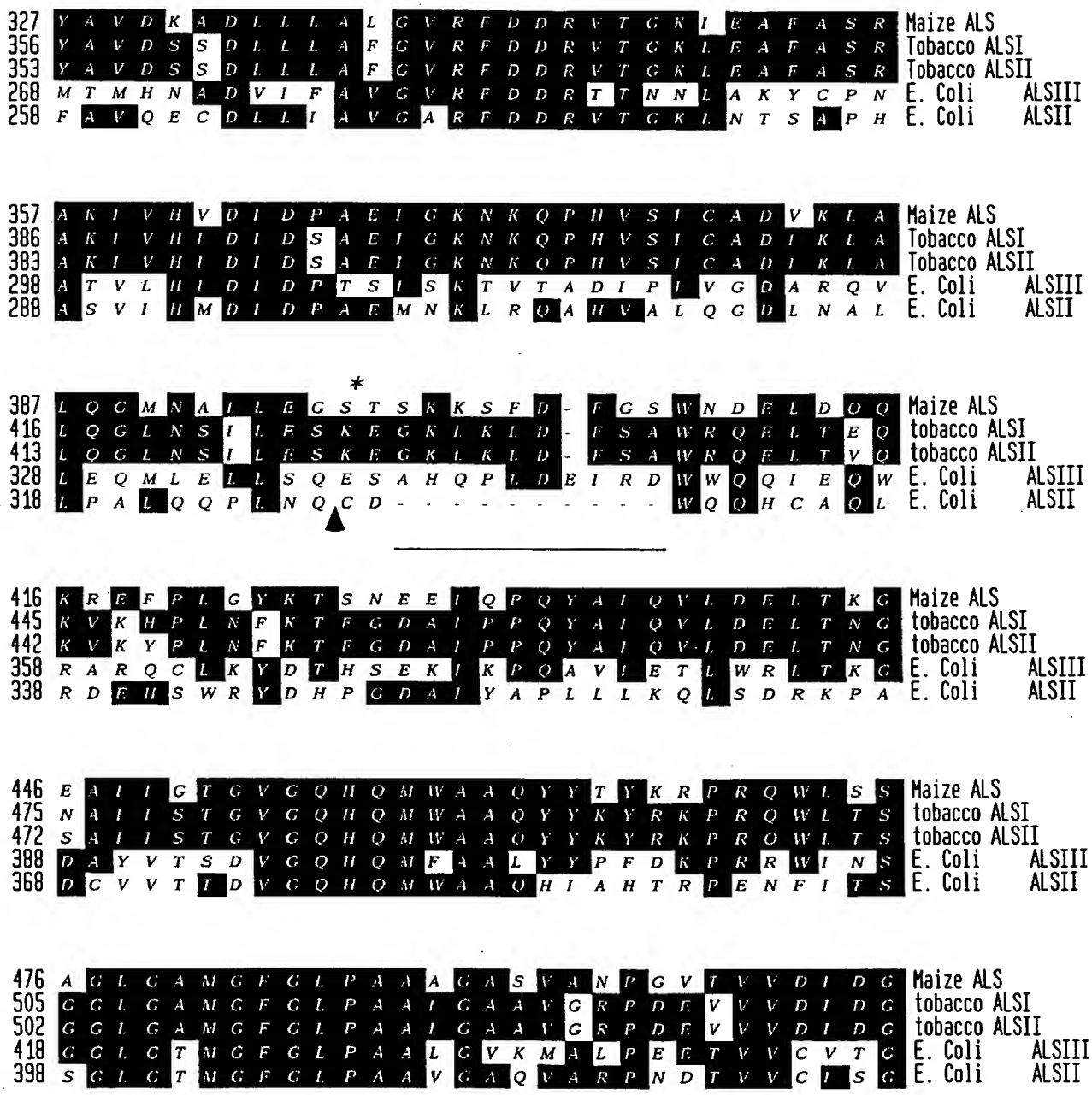

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FIG. 7

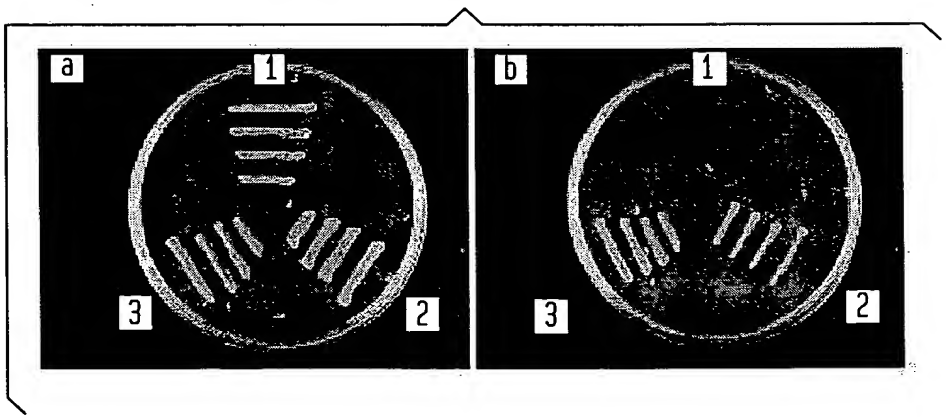

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FIG. 8A

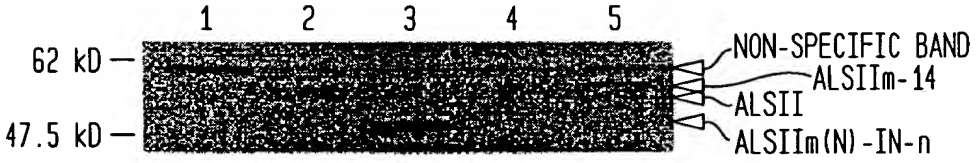


FIG. 8B

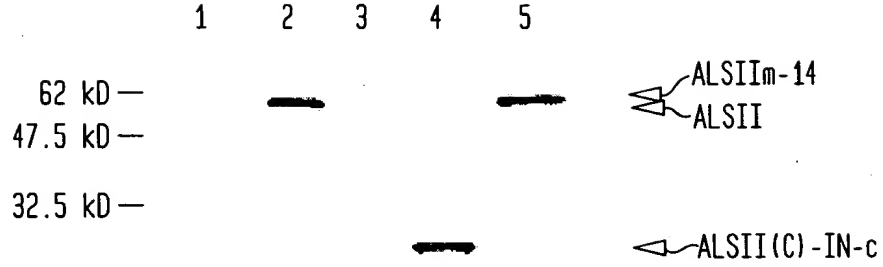
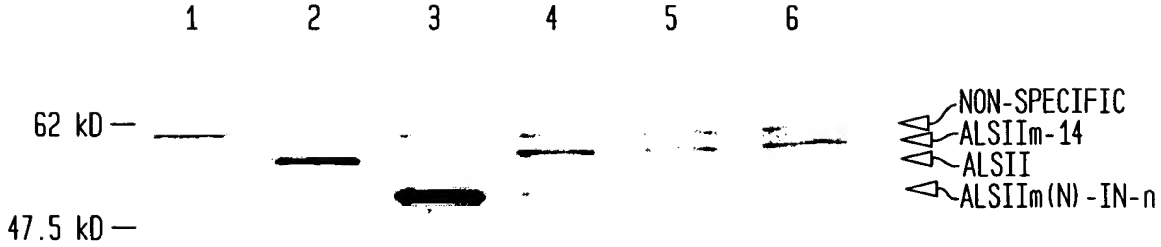


FIG. 8C



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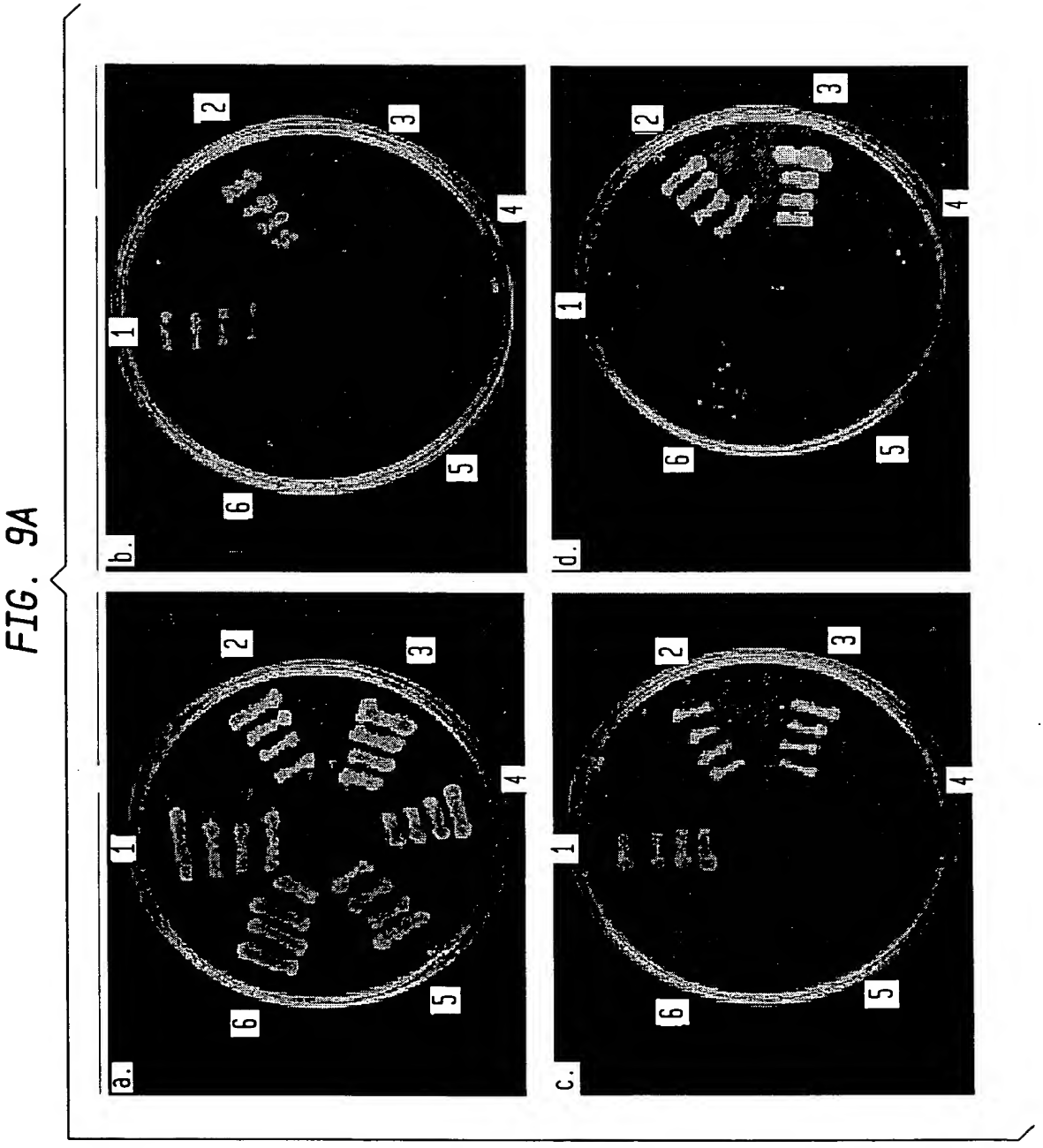

FIG. 9A

FIG. 9B

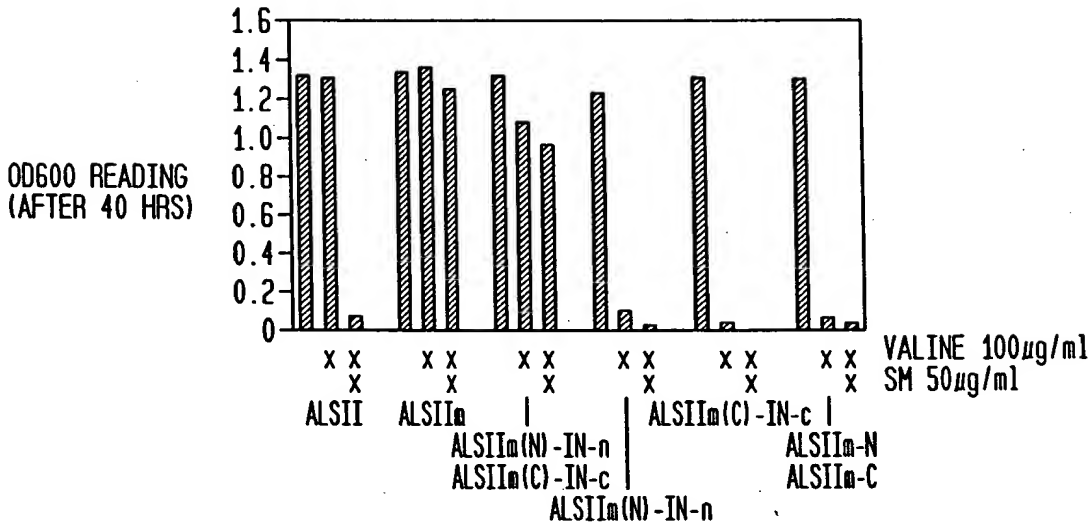
OD600 READING
(AFTER 40 HRS)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
VALINE 100µg/ml
SM 50µg/ml
ALSII
ALSIIm
ALSIIm(N)-IN-n
ALSIIm(C)-IN-c
ALSIIm(C)-IN-c
ALSIIm-N
ALSIIm-C
ALSIIm(N)-IN-n

FIG. 9C

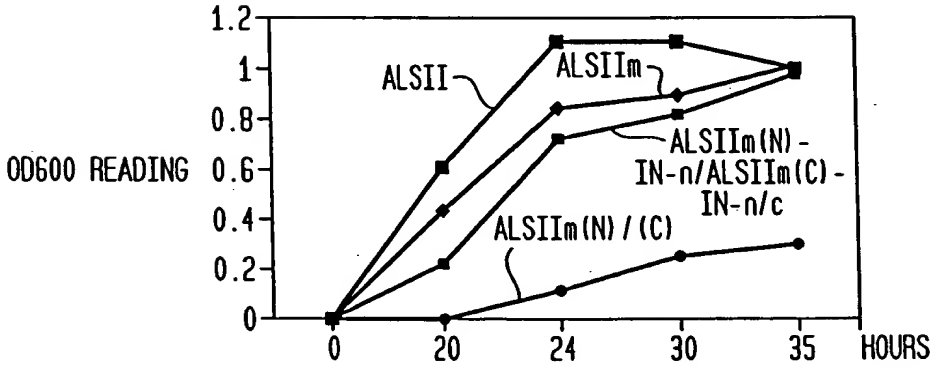
OD600 READING
1.2
1
0.8
0.6
0.4
0.2
0
ALSII
ALSIIm
ALSIIm(N)-
IN-n/ALSIIm(C)-
IN-n/c
ALSIIm(N)/(C)
0
20
24
30
35
HOURS

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FIG. 10A

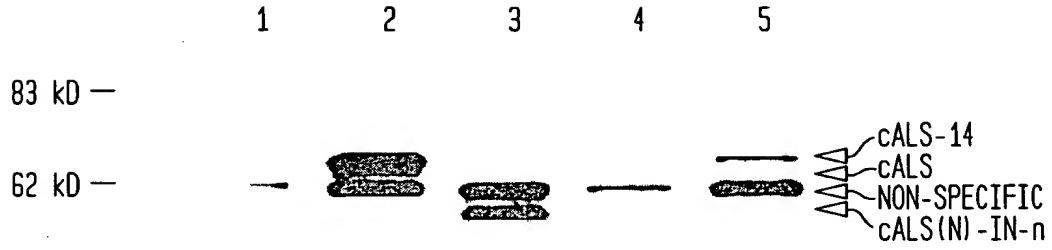

FIG. 10B

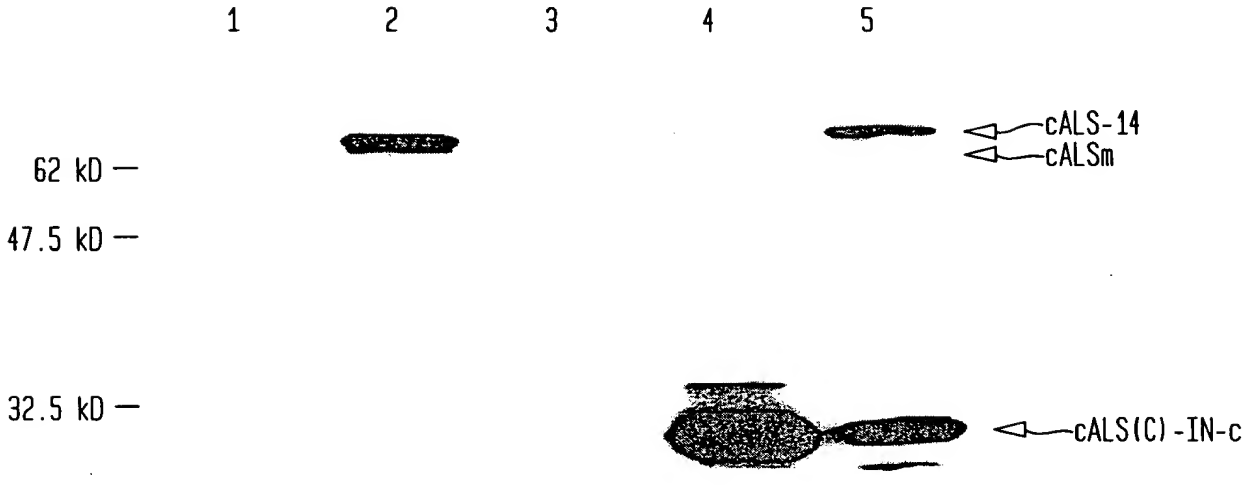

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FIG. 11

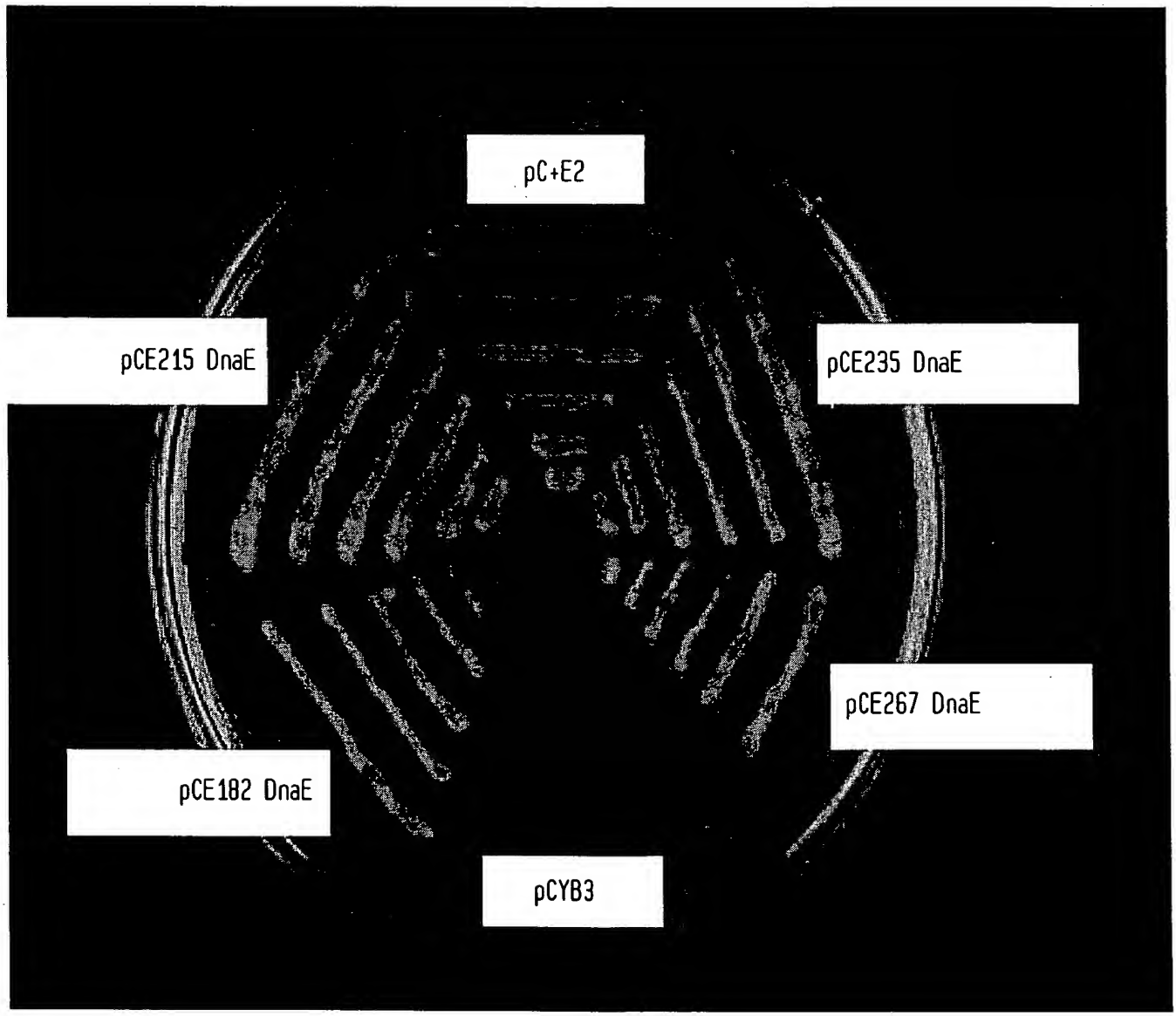

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FIG. 12

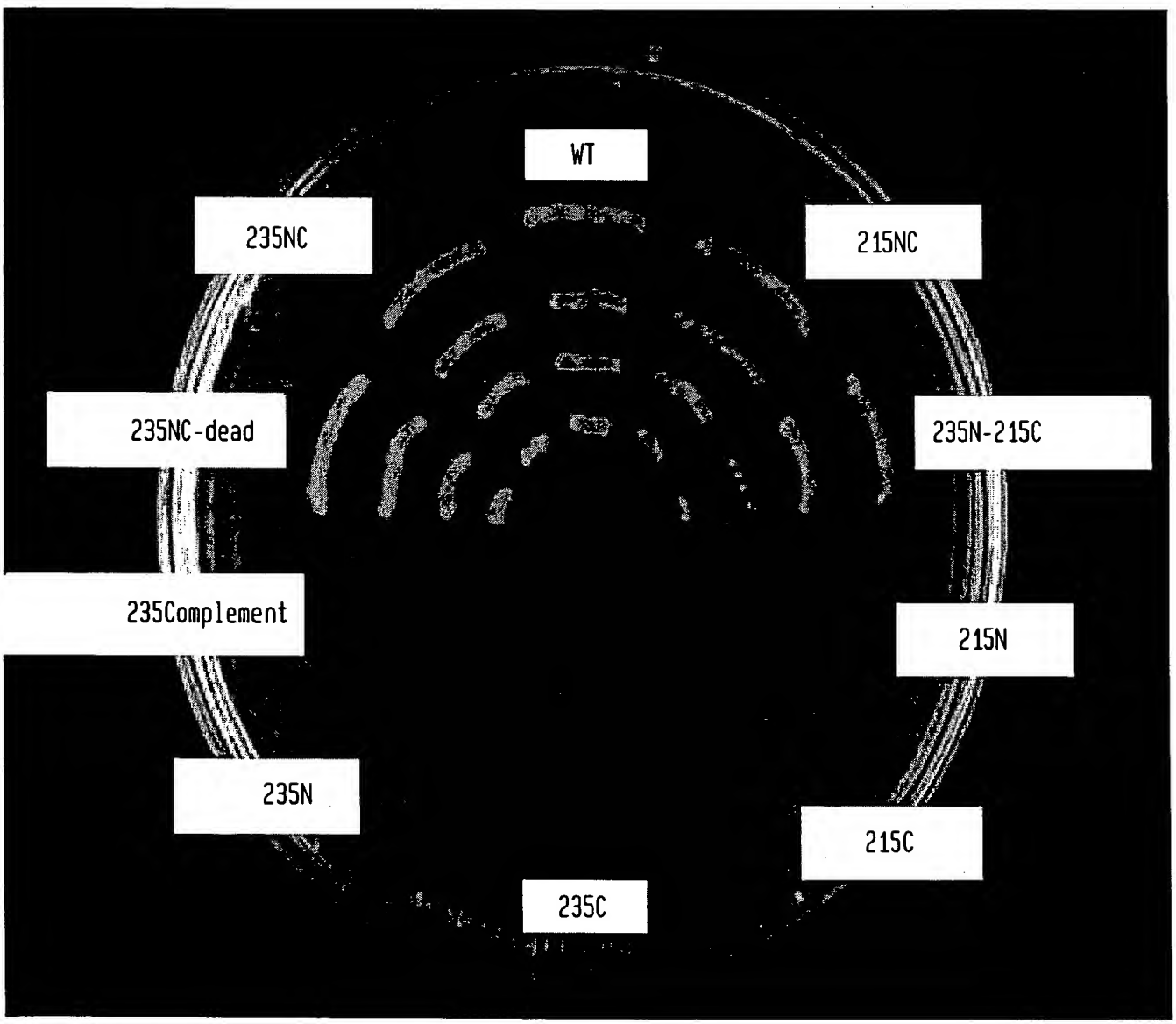


FIG. 13A

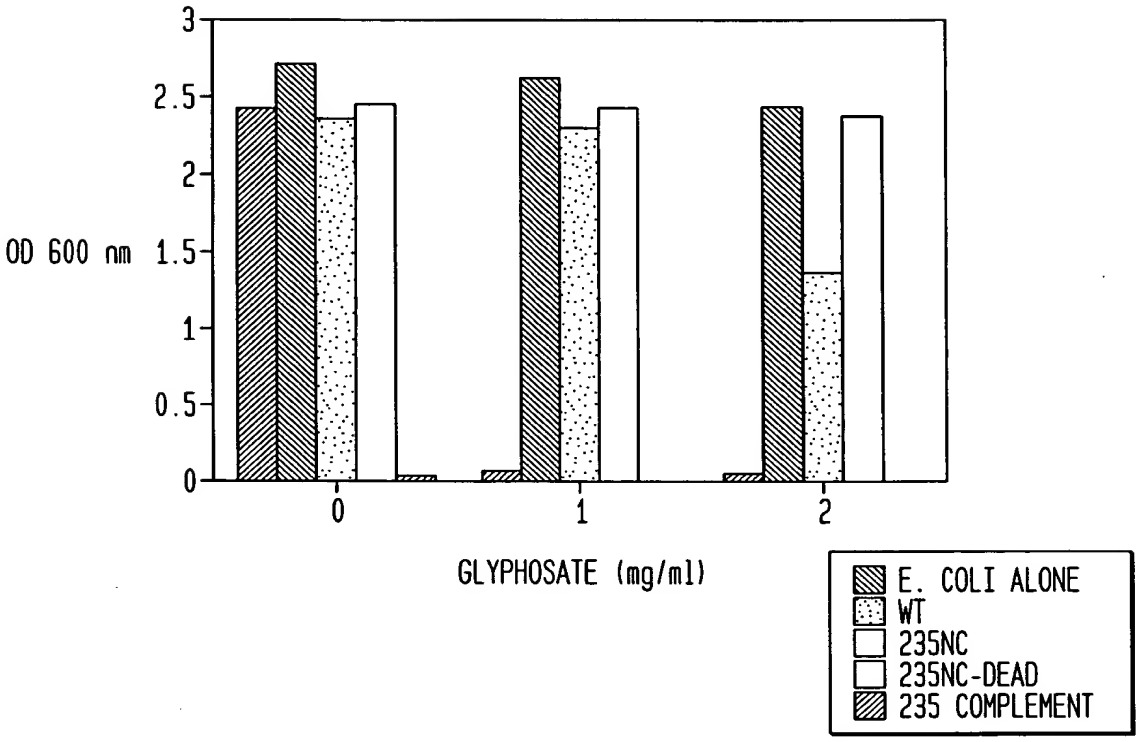


FIG. 13B

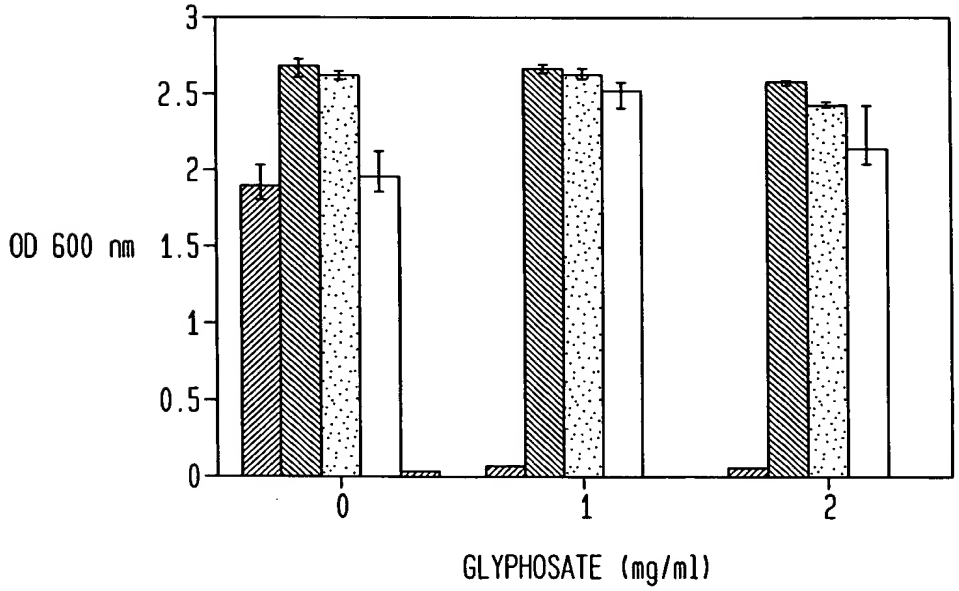


FIG. 14

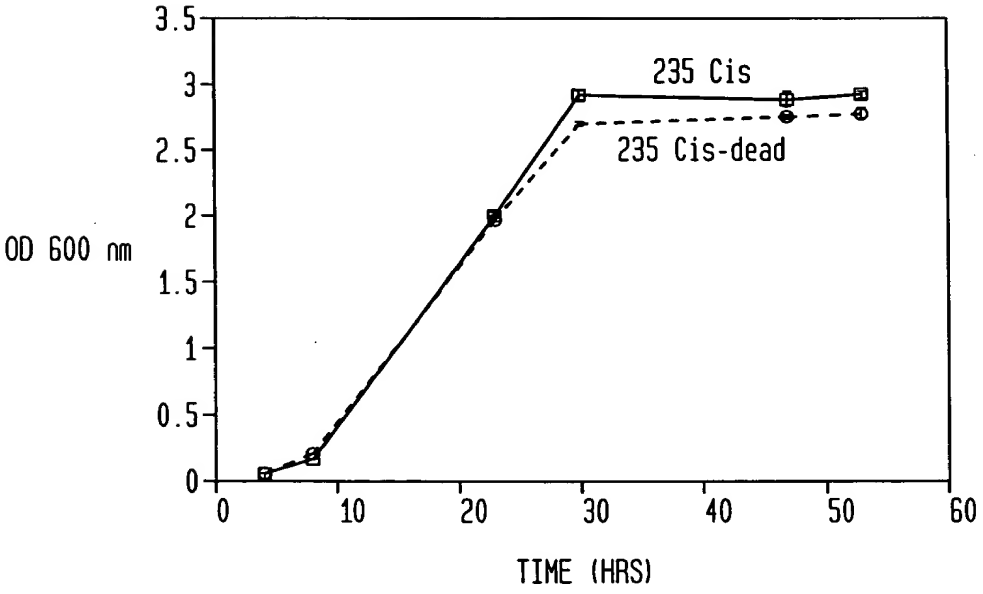

3.5
3
2.5
2
1.5
1
0.5
0
OD 600 nm
235 Cis
235 Cis-dead
0
10
20
30
40
50
60
TIME (HRS)

FIG. 15-1

EPSPS Insertion Site	Amino acid sequence inserted	Clone
Q7/P8	CLNIQ	pCE-5aa 129
A10/R11	VFKHA	pCE-5aa 47
P35/C36	LFKQP	pCE-5aa 7
D48/D49	CLNSD	pCE-5aa 50
S67/A68	CLNIS	pCE-5aa 8
D69/R70	CLNTD	pCE-5aa 44
R70/T71	CLNNR	pCE-5aa 10
C73/D74	CLNSC	pCE-5aa 32
D74/I75	CLNSD	pCE-5aa 5
L82/R83	CLNTL	pCE-5aa 3
P85/G86	VFKQP	pCE-5aa 12
M121/K122	CLNSM	pCE-5aa 42
Y148/P149	CLNNY	pCE-5aa 37
L182/A183	CLNTL	pCE-5aa 22
A183/P184	CLNMA	pCE-5aa 11
K185/D186	VFKHK	pCE-5aa 112
K185/D186	CLNTK	pCE-5aa 212
D186/T187	CLNKD	pCE-5aa 33
I188/I189	MFKQI	pCE-5aa 151
I189/R190	CLNII	pCE-5aa 114
E194/L195	LFKHE	pCE-5aa 227
F211/G212	VFKHF	pCE-5aa 162
V213/E214	CLNSV	pCE-5aa 1
I215/A216	VFKQI	pCE-5aa 2
A216/N217	MFKQA	pCE-5aa 208
H218/H219	LFKHH	pCE-5aa 28
Q221/Q222	LFKHQ	pCE-5aa 4
V225/K226	MFKHV	pCE-5aa 203
K226/G227	VFKQK	pCE-5aa 25
Q230/Y231	LFKQQ	pCE-5aa 102
S233/P234	LFKHS	pCE-5aa 40
G235/R236	CLNTG	pCE-5aa 35
R267/K268	CLNSR	pCE-5aa 23
L238/V239	VFKHL	pCE-5aa 154

FIG. 15-2

EPSPS Insertion Site	Amino acid sequence inserted	Clone
I311/P312	CLNNI	pCE-5aa 29
Q375/H376	LFKHQ	pCE-5aa 15
Q375/H376	CLNIQ	pCE-5aa 223
H376/A377	CLNKH	pCE-5aa 38
Y382/N383	MFKQY	pCE-5aa 31
E418/Q419	LFKHE	pCE-5aa 36
Q419/L420	CLNKQ	pCE-5aa 46
S424/T425	CLNMS	pCE-5aa 9

FIG. 16

EPSPS Insertion Site	Amino acid sequence inserted	Clone
L31/A32	LCLNILA	pCE-5aa 21d
N55/A56	NCLNINA	pCE-5aa 4d
L57/S58	LMFKHLS	pCE-5aa 217
T71/R72	TLFKHTR	pCE-5aa 24d
K122/E123	KVFKQKE	pCE-5aa 126
H128/L129	HLVFKHL	pCE-5aa 142
L176/L177	LCLNTLL	pCE-5aa 122
L238/V239	LCLNNLV	pCE-5aa 205
E240/G241	EVFKHEG	pCE-5aa 171
K256/G257	KVFKQKG	pCE-5aa 140
T286/I287	TCLNTTI	pCE-5aa 180
M328/N329	MCLNNMN	pCE-5aa 115
L331/R332	LLFKQLR	pCE-5aa 124
R344/L345	RCLNNRL	pCE-5aa 107
M348/A349	MVFKQMA	pCE-5aa 3d
A349/T350	AMFKQAT	pCE-5aa 110
L404/D405	LVFKHLD	pCE-5aa 199
K411/T412	KMFKQKT	pCE-5aa 5d
Y416/F417	YCLNNYF	pCE-5aa 163

FIG. 17

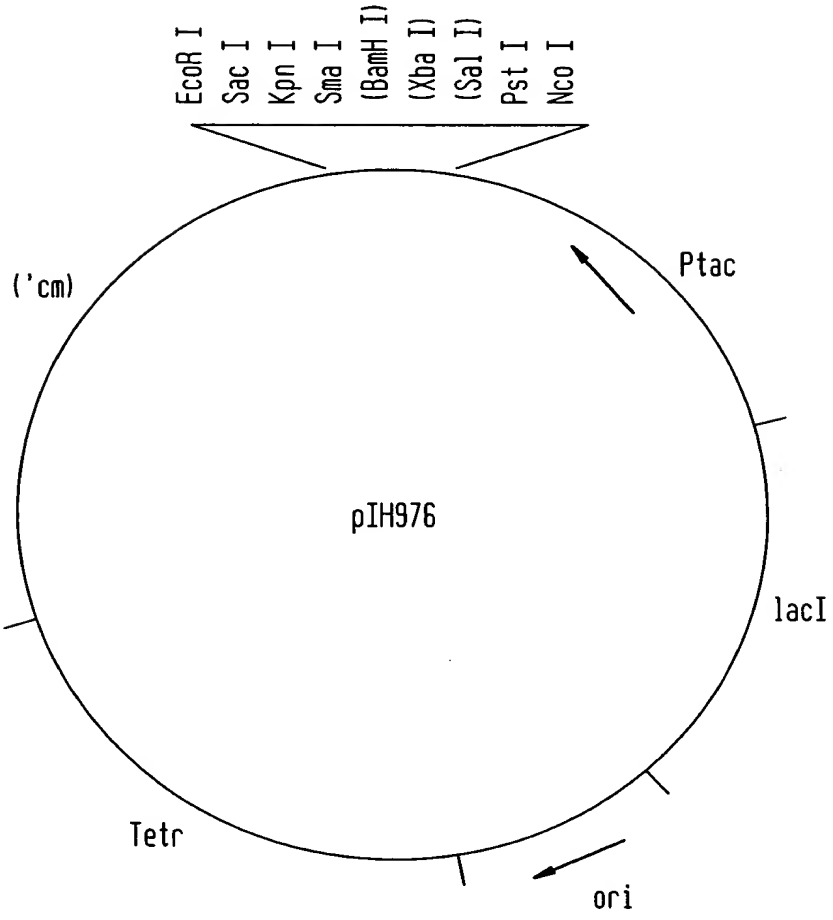
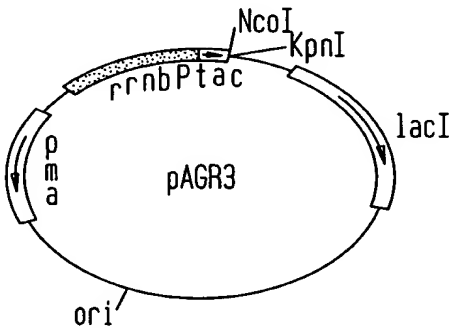

EcoR I
Sac I
Kpn I
Sma I
(BamH I)
(Xba I)
(Sal I)
Pst I
Nco I
('cm)
Ptac
pIH976
lacI
Tetr
ori

FIG. 18



EXPRESSION PLASMID pAGR3: 5910 bp.
PROMOTER AND CLONING SITE MAP:

```
          lac operator
  1 GAATTGTGAG CGCTCACAAT TCTAGGATGT TAATTGCGCC GACATCATAA

                                      -35 region
 51 CGGTTCTGGC AAATATTCTG AAATGAGCTG TTGACAATTA ATCATCGGCT

     -10 region        lac operator              rbs
101 CGTATAATGT GTGGAATTGT GAGCGGATAA CAATTTCACA CAGGAAACAG

       start
151 ACCATGGTGA ATTCTAGAGC TCGAGGATCC GCGGTACCCG GGCATGCATT
      NcoI     EcoRI XbaI SacI XhoI BamHI SacII KpnI SmaI        BstBI

201 CGAAGCTTCC TTAAGCGGCC GTCGACCGAT GCCCTTGAGA GCCTTCAACC
      HindIII AflII     EagI   SalI
```

FIG. 19A

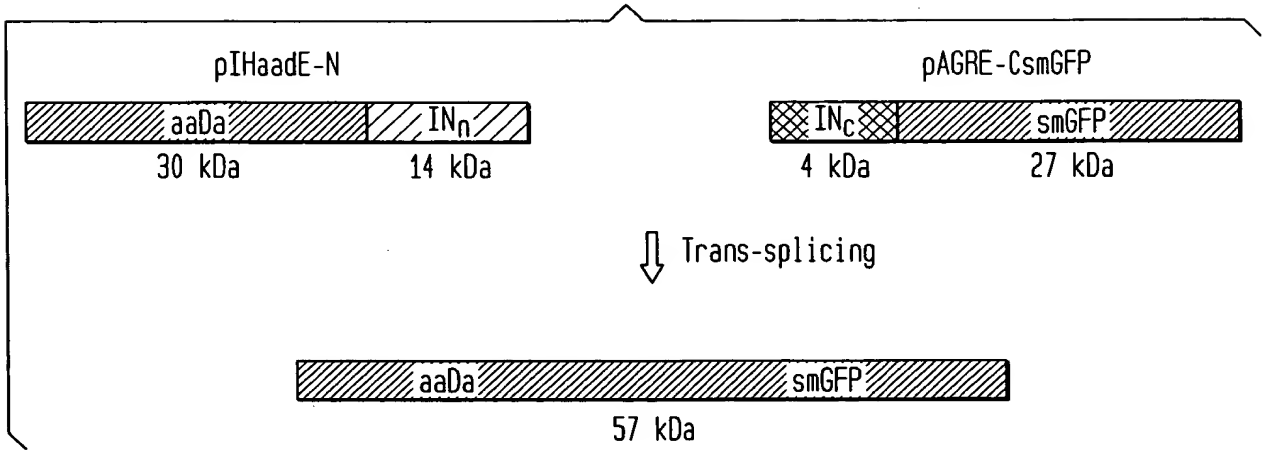


FIG. 19B

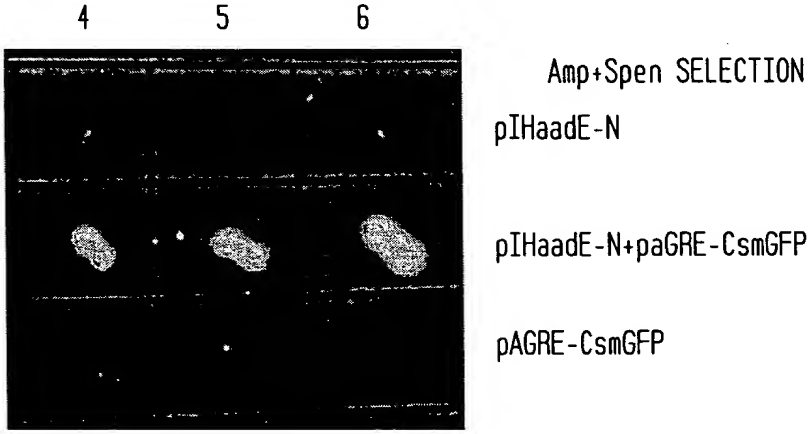


FIG. 19C

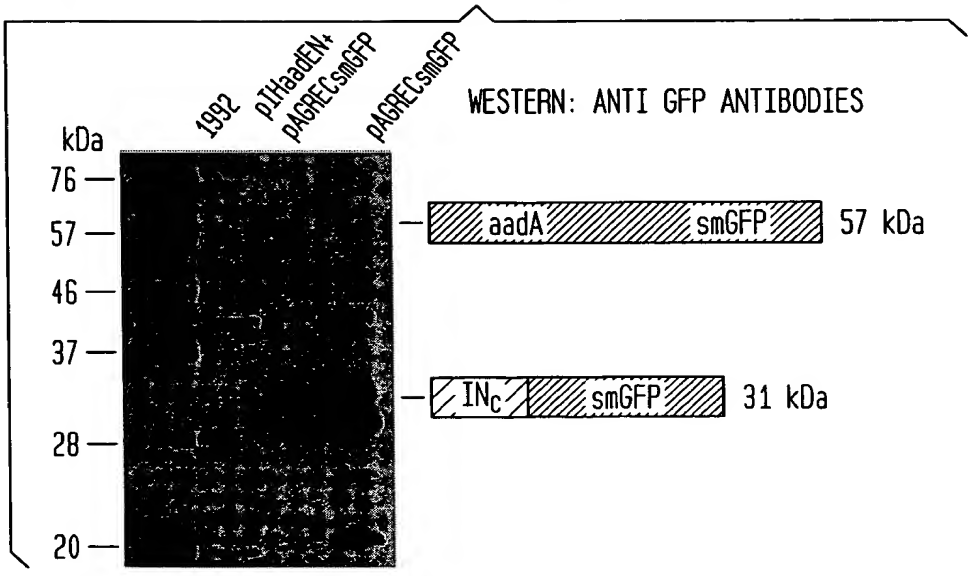


FIG. 20

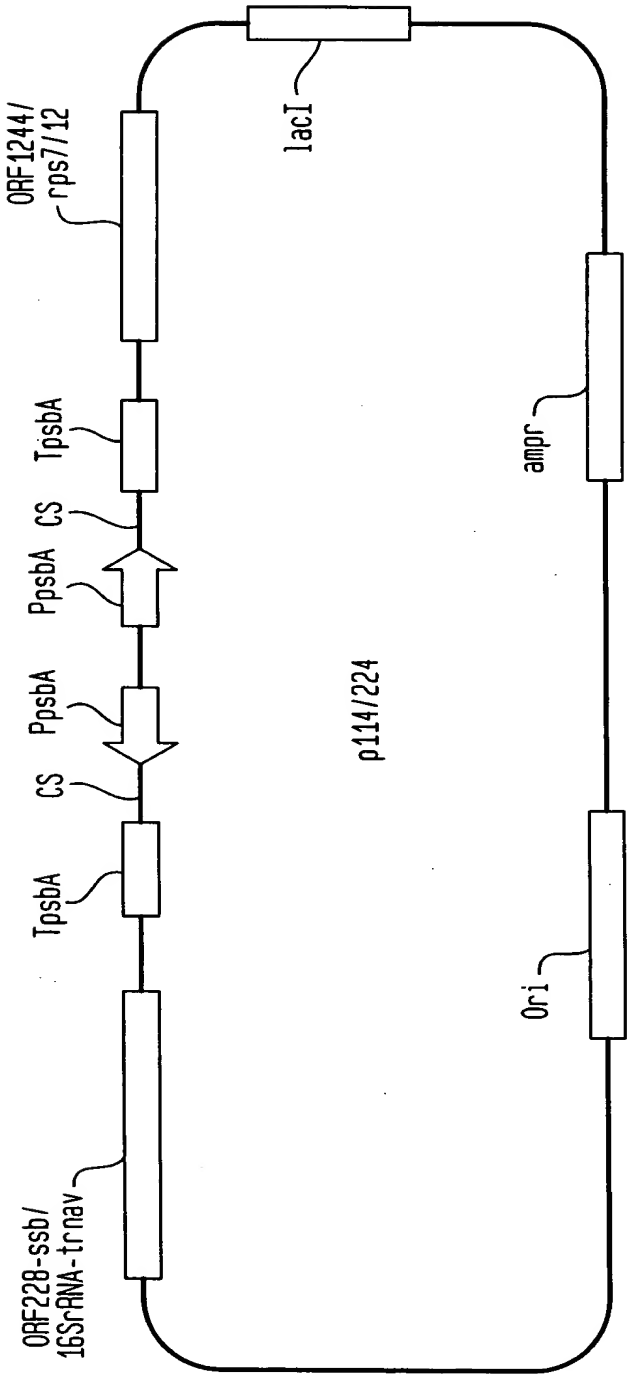

ORF1244/
rps7/12
TpsbA
CS
PpsbA
PpsbA
CS
TpsbA
ORF228-ssb/
16SrRNA-trnav
lacI
ampr
Ori
p114/224

FIG. 21A

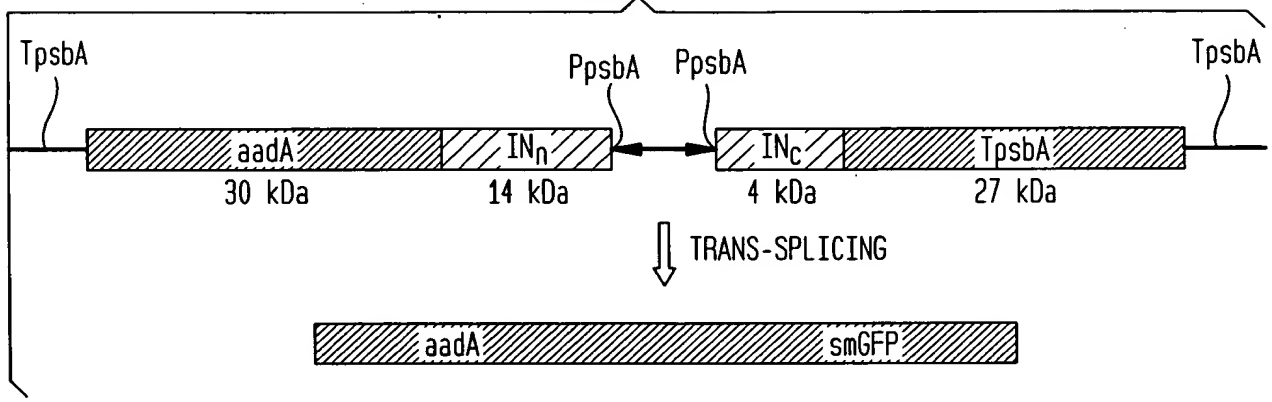


FIG. 21B

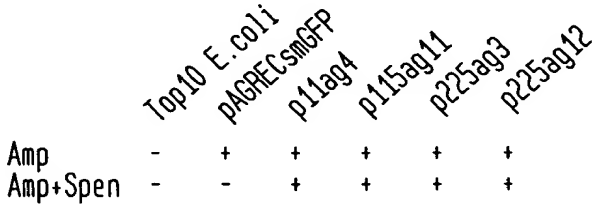


FIG. 21C

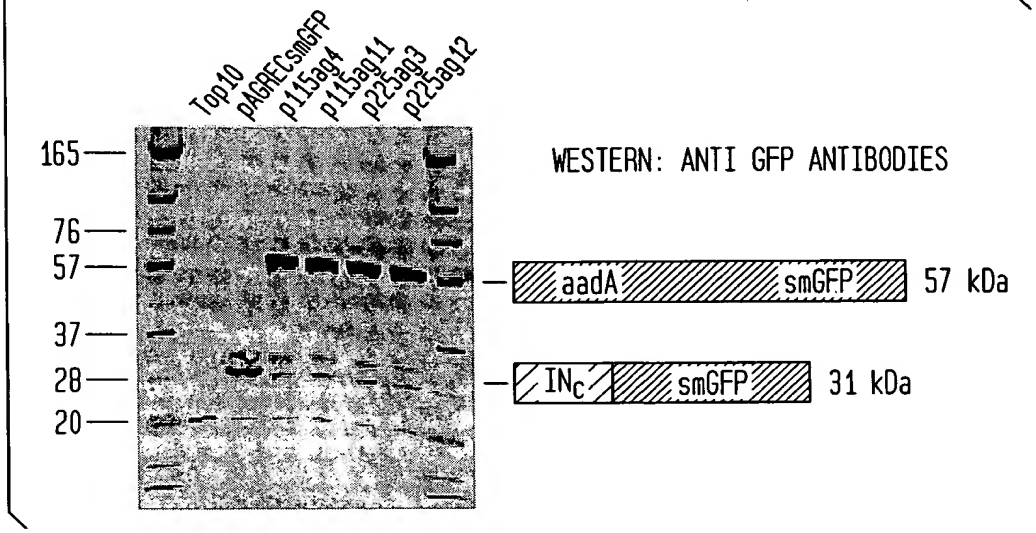


FIG. 22

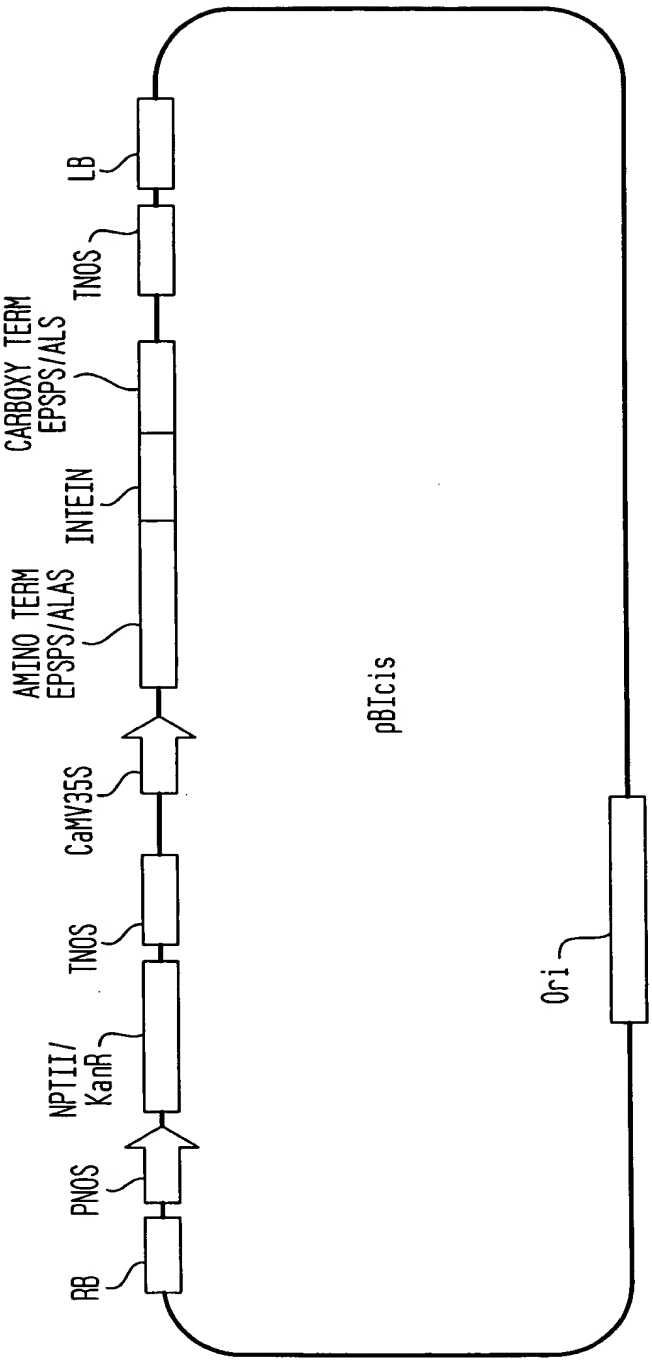

LB
TNOS
CARBOXY TERM EPSPS/ALS
INTEIN
AMINO TERM EPSPS/ALAS
CaMV35S
TNOS
NPTII/ KanR
PNOS
RB
pBIcis
Ori

FIG. 23

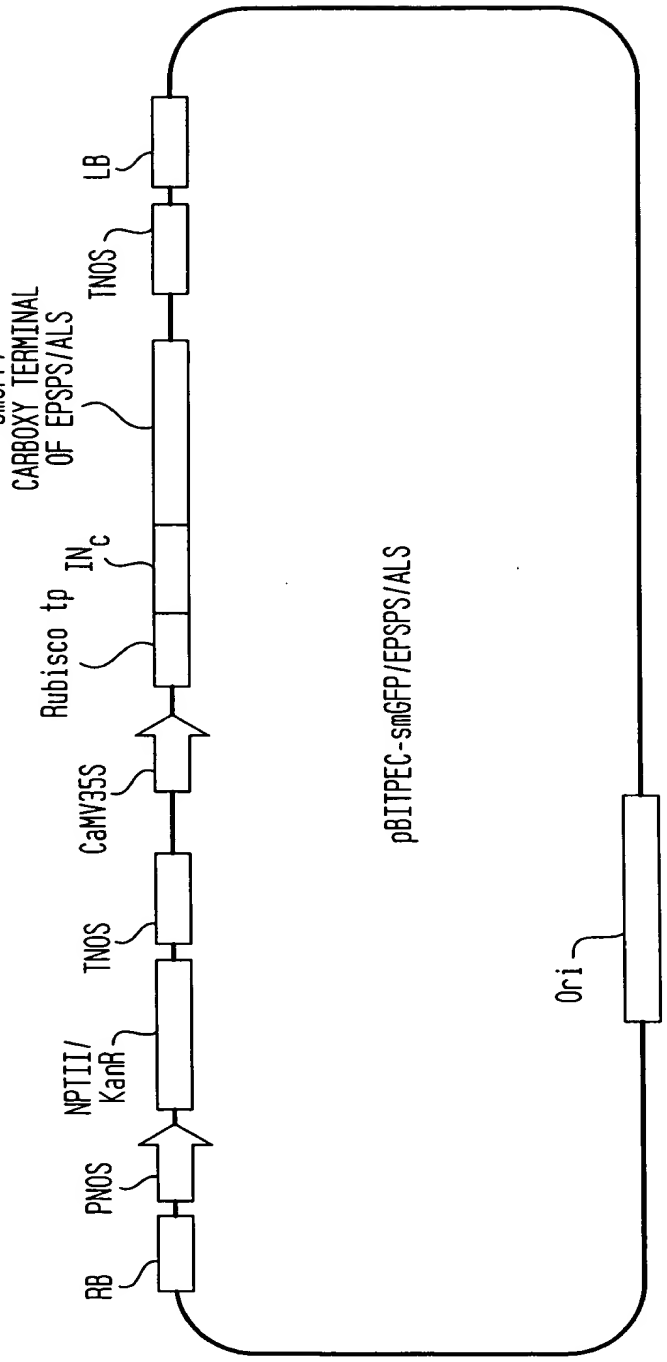

RB
PNOS
NPTII/
KanR
TNOS
CaMV35S
Rubisco tp
IN$_c$
smGFP/
CARBOXY TERMINAL
OF EPSPS/ALS
TNOS
LB
pBITPEC-smGFP/EPSPS/ALS
Ori

FIG. 24

GAATAGATCTACATACACCTTGGTTGACACGAGTATATAAGTCATGTT
ATACTGTTGAATAACAAGCCTTCCATTTTCTATTTTGATTTGTAGAAA
ACTAGTGTGCTTGGGAGTCCCTGATGATTAAATAAACCAAGATTTTAC
CTTAATTAAG

FIG. 25

GATCCTGGCCTAGTCTATAGGAGGTTTTGAAAAGAAAGGAGCAATAAT
CATTTTCTTGTTCTATCAAGAGGGTGCTATTGCTCCTTTCTTTTTTTC
TTTTTATTTATTTACTAGTATTTTACTTACATAGACTTTTTTGTTTAC
GTATTCT

FIG. 26

catATGGCgTCcATGATcTCCTCgTCcGCgGTGACcACgGTCAGCCGcG
CgTCcACGGTGCAgTCGGCCGCGGTGGCcCCgTTCGGCGGCCTCAAgTC
CATGACcGGcTTCCCgGTcAAGAAGGTCAACACgGACATcACgTCCATc
ACgAGCAAcGGcGGcAGgGTgAAGTGCATGcgaagagc

FIG. 27-1

GTTAACTACGTCAGGTGGCACTTTTCGGGGAAATGTGCGCGGAACCC
CTATTTGTTTATTTTTCTAAATACATTCAAATATGTATCCGCTCATG
AGACAATAACCCTGATAAATGCTTCAATAATATTGAAAAAGGAAGAG
TATGAGTATTCAACATTTCCGTGTCGCCCTTATTCCCTTTTTTGCGG
CATTTTGCCTTCCTGTTTTTGCTCACCCAGAAACGCTGGTGAAAGTA
AAAGATGCTGAAGATCAGTTGGGTGCACGAGTGGGTTACATCGAACT
GGATCTCAACAGCGGTAAGATCCTTGAGAGTTTTCGCCCCGAAGAAC
GTTCTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGGTA
TTATCCCGTGTTGACGCCGGGCAAGAGCAACTCGGTCGCCGCATACA
CTATTCTCAGAATGACTTGGTTGAGTACTCACCAGTCACAGAAAAGC
ATCTTACGGATGGCATGACAGTAAGAGAATTATGCAGTGCTGCCATA
ACCATGAGTGATAACACTGCGGCCAACTTACTTCTGACAACGATCGG
AGGACCGAAGGAGCTAACCGCTTTTTTGCACAACATGGGGGATCATG
TAACTCGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATACCA
AACGACGAGCGTGACACCACGATGCCTGTAGCAATGGCAACAACGTT
GCGCAAACTATTAACTGGCGAACTACTTACTCTAGCTTCCCGGCAAC
AATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTG
CGCTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGC
CGGTGAGCGTGGGTCTCGCGGTATCATTGCAGCACTGGGGCCAGATG
GTAAGCCCTCCCGTATCGTAGTTATCTACACGACGGGGAGTCAGGCA
ACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTT
AGATTGATTTACCCCGGTTGATAATCAGAAAAGCCCCAAAAACAGGA
AGATTGTATAAGCAAATATTTAAATTGTAAACGTTAATATTTTGTTA
AAATTCGCGTTAAATTTTTGTTAAATCAGCTCATTTTTTAACCAATA
GGCCGAAATCGGCAAAATCCCTTATAAATCAAAAGAATAGCCCGAGA
TAGGGTTGAGTGTTGTTCCAGTTTGGAACAAGAGTCCACTATTAAAG
AACGTGGACTCCAACGTCAAAGGGCGAAAAACCGTCTATCAGGGCGA
TGGCCCACTACGTGAACCATCACCCAAATCAAGTTTTTTGGGGTCGA
GGTGCCGTAAAGCACTAAATCGGAACCCTAAAGGGAGCCCCCGATTT
AGAGCTTGACGGGGAAAGCGAACGTGGCGAGAAAGGAAGGGAAGAAA
GCGAAAGGAGCGGGCGCTAGGGCGCTGGCAAGTGTAGCGGTCACGCT
GCGCGTAACCACCACACCCGCCGCGCTTAATGCGCCGCTACAGGGCG
CGTAAAAGGATCTAGGTGAAGATCCTTTTTGATAATCTCATGACCAA
AATCCCTTAACGTGAGTTTTCGTTCCACTGAGCGTCAGACCCCGTAG
AAAAGATCAAAGGATCTTCTTGAGATCCTTTTTTTCTGCGCGTAATC
TGCTGCTTGCAAACAAAAAAACCACCGCTACCAGCGGTGGTTTGTTT
GCCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAACTGGCTTCA
GCAGAGCGCAGATACCAAATACTGTTCTTCTAGTGTAGCCGTAGTTA
GGCCACCACTTCAAGAACTCTGTAGCACCGCCTACATACCTCGCTCT
GCTAATCCTGTTAC

FIG. 27-2

CAGTGGCTGCTGCCAGTGGCGATAAGTCGTGTCTTACCGGGTTGGA
CTCAAGACGATAGTTACCGGATAAGGCGCAGCGGTCGGGCTGAACG
GGGGGTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCG
AACTGAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCC
CGAAGGGAGAAAGGCGGACAGGTATCCGGTAAGCGGCAGGGTCGGA
ACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAACGCCTGGTATC
TTTATAGTCCTGTCGGGTTTCGCCACCTCTGACTTGAGCGTCGATT
TTTGTGATGCTCGTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGC
AACGCGGCCTTTTTACGGTTCCTGGCCTTTTGCTGGCCTTTTGCTC
ACATGTAATGTGAGTTAGCTCACTCATTAGGCACCCCAGGCTTTAC
ACTTTATGCTTCCGGCTCGTATGTTGTGTGGAATTGTGAGCGGATA
ACAATTTCACACAGGAAACAGCTATGACCATGATTACGCCAAGCTA
CGTAATACGACTCACTAGTGGGCAGATCTTCGAATGCATCGCGCGC
TTGACGATATAGCAATTTTGCTTGGATTTATCAGTCGAAGCAGGAG
ACAATATACCTTGATATTCTCGATCATTCTTTGATTCAAAGCATCG
TTCCATCTCAATTGAAAAAGCAAATAACGTTTCAAGAACAAATCTA
GTTCTGCTTCCGTGTTGCTTTTGTATTGTTTTTTCTTTTTACCCTT
CTTTGTGTCTGATTCCGCGTAATCTTTTTTAAGAGCGTTTTGATGT
TTTGAGAGAACAGGGCCCAGATTTCCTTTGTTTTCTATATCTGATC
CACGCTCTTTTTCTCCTTGACTTGCGGGTTCTTTTGCTTCTTGAAT
TCGATTCTTTATTTTTTTATTTGATCGTAGAAAAAAGTTTTGTTTT
TGGTTTTTATTGATGTTTTTATTTTGACTAACATTTTCATTTGTAT
TCAAATTTAAAAGAAGTAATTTGCTTGGTATAATCCACGGTTTTAT
TTTATATACATTATAAAGTGGTACAAATTCTGGGAAGAACCAAAAT
TCCAGATTCAATATGGGACGATTTAATATTTTTTCATTCATTCCCA
TCCAATCAAAAAAGGCTTTTTTCGAATTTTTTTGATTGTTTTCTGG
ATTTTGATGAATCGTAAGATAAAAAAAGCCTTTTTTATCAATTTTA
TCAATTATTTGATAATTATTAATACCAATTTTAGTATTTGGATTAC
TGTTGGTATCGATCTTAACCCAGGCCTCAATATCTTCTTTTTGTCT
AAGAGAAAAATGGATAATTTTCCAATCAAAATATTTTCTATCGAGA
TTTCTTTCTATATATAGAATATTGCCTTTTCTTAGATAATTATTGA
TATGAAGATTGCCGAGCATATCAAAAAGGTTGTGTTTGGACGTGTT
GGAATTAGAAGAAATTTCGAGGTTCTTATTTACTTGAAAGGGTAAT
CTAGAAATAAAAGAGTCATTTTTTTTTTCATAATTAATCGATTTAT
ATGCTAAAAGATCATATCTATAACATTTTTGAAAATTATCTTTTTG
GTTTGCTAATGAATAGAGCTCAGAATCATTTTCTTTTTTGTAATGA
ATTAATTGGTCTTTTTCATATGAATTCCATTTGTTTAAATTTCGAT
TTTGAGCCATACAACCTTGATTAACCCTATTTCGCCATTTTTGTGG
CATTAATCTAGACCATCTAATCTGAGATAAATCGTACGagaatact
caatCATGAATAAATGCAAGAAAATAACCTCTCCTTCTTTTTCTAT
AATGTAAACAAAAAAGTCTATGTAAGTAAAATACTAGTAAATAAAT
AAAAAGAAAAAAAGAAAGGAGCAATAGCACCCTCTTGATAGAACAA
GAAAATGATTAT

FIG. 27-3

TGCTCCTTTCTTTTCAAAACCTCCTATAGACTAGGCCAGGATCCTCGA
GcttaattaaGGTAAAATCTTGGTTTATTTAATCATCAGGGACTCCCA
AGCACACTAGTTTTCTACAAATCAAAATAGAAAATAGAAAATGGAAGG
CTTTTTATTCAACAGTATAACATGACTTATATACTCGTGTCAACCAAG
GTGTATGTAGATCtattcCTGCAGGATATCTGGATCCACGAAGCTTCC
CATGGGAATAGATCTACATACACCTTGGTTGACACGAGTATATAAGTC
ATGTTATACTGTTGAATAAAAAGCCTTCCATTTTCTATTTTGATTTGT
AGAAAACTAGTGTGCTTGGGAGTCCCTGATGATTAAATAAACCAAGAT
TTTACCGTTTAAACACCGGTGATCCTGGCCTAGTCTATAGGAGGTTTT
GAAAAGAAAGGAGCAATAATCATTTTCTTGTTCTATCAAGAGGGTGCT
ATTGCTCCTTTCTTTTTTTCTTTTTATTTATTTACTAGTATTTTACTT
ACATAGACTTTTTTGTTTACATTATAGAAAAAGAAGGAGAGGTTATTT
TCTTGCATTTATTCATGATTGAGTATTCTcctaggCGTATTGATAATG
CCGTCTTAACCAGTTTTTCCATTGATTGATTCTATAACTCTGAAGTTT
CTTATGTTTTAATTCAGAATGAAATATTCCTAGTGTTCGAAAATAGTC
CTTTATTTTAGTCTTAAGGAAAAAAGACGTTCTGTTATATTGAAGAAC
AGATCTTAATTTAGACAAATTAATAACTTGGGGTTGTGATAATTTGTA
AAATACATATGCTTGTGATAAGTAGGATAAATCAAAAAAAATATGTGA
ATTTTTCTTACTAATATTATAAAGTGACTTTTTTATAGTCGAAATAAA
GTGAATTTTTTTTTGATTATTAATTTTTTCTTGATTTATTTCATTATT
GGAAATGTATTTATCAATCAATTTGTTTGTTGATTCAAGAAAGAGTTG
TGTATTAATTCTGGGAATATTAATGATAGATAAAAATAGATCGATGTA
TAATCTTTGAATGAATAATTTTAGAAAATAATGGAATTTCCATATTAA
TCGAGTATTTCTTCTTTTTAATATTTGGAAAATCTTTTTTGGCGATTC
GAATTTTTTAATATTATTTGTTTTATTAGGACTAATGTCTATTTCTGG
AGTTACTTTCTTTTTCTCTTTTGTAATTCTTTCTATTTGATTTTTGAT
TGTACTTGTTCTATCAGTCAAATCCTTCATTTTGCTTTCTATCAGTGA
AGAATTTGGCCAATTTCCAGATTCAATTTGACTAAATGATTCGTTAAT
TATCTGATTACTCATTAGAGAATCTTTTTCTTTTTTCGTTTCATTCGA
TTCATCTATTTCTTTGAGTCTAAATAATACAATTGGATTTACTTTTGA
AAGTTCTTTTTTCATTTTTTTTATAAATAGACTACTTTTGATAAGCCA
TTTTTTGGTTTCTTTTGAAATTCTTCGAAATAATTTTATTTTTCCTTT
GAAAACTTTTAGAGTTATAAAATATTTCTTTTTGAATTTTCCAATTTT
TTTTTCGAGTTCCTTAAAAATGGGCTCAAAAAAAGAAGGGCGTTTTCG
GGGAGAACCAAAGGGAAGTTCAGCTTCCATTCCCCAAACTGTTAAAAA
ACAAAAATCATCTTTTTGTTTTTTCTTTTTCATTAGCTCTCCACGGGA
GGAGTACAGTTTAGATATATGCCAAGGTTTCAGACAAAAAGGAAATAA
TATTTTGATCTGAATGCCATCTTTCAACCAATTTTTTGGAAATTCTGT
TTCTGATAATTGAACACCATTATAAGTACATTTAATATGCATTTCTCT
ATTCCATTCCTGCAAATCTTCAGACCATTCAGGAAGTTGCAAGACTAA
CATACGCCCGAGATTTTTGGCTATTATCAATGAAGGTAATACAATATA
TTTTCGAAGAATTG

FIG. 27-4

ATTGAGTTATTAACATGTAACCTCTTATTATTTGCGCAAAAGGAATGGT
ATCCCAGGCTTCTGCTATCTCTATCCGTGCTTTTTCCTTTCTTTTGTTC
TCCCCTTTTTTGTCCTTTTCCTTTTTCTCTTCTCTTTTTGTTTGTTCTT
CTCTAGACTCTAGAATCTTGAATTCGGTACCCTCTAGTCAAGGCCTTAA
GTGAGTCGTATTACGGACTGGCCGTCGTTTTACAACGTCGTGACTGGGA
AAACCCTGGCGTTACCCAACTTAATCGCCTTGCAGCACATCCCCCTTTC
GCCAGCTGGCGTAATAGCGAAGAGGCCCGCACCGATCGCCCTTCCCAAC
AGTTGCGCAGCCTGAATGGCGAATGGCGCTTCGCTTGGTAATAAAGCCC
GCTTCGGCGGGCTTTTTTTT

FIG. 28-1

GTTAACTACGTCAGGTGGCACTTTTCGGGGAAATGTGCGCGGAACC
CCTATTTGTTTATTTTTCTAAATACATTCAAATATGTATCCGCTCA
TGAGACAATAACCCTGATAAATGCTTCAATAATATTGAAAAAGGAA
GAGTATGAGTATTCAACATTTCCGTGTCGCCCTTATTCCCTTTTTT
GCGGCATTTTGCCTTCCTGTTTTTGCTCACCCAGAAACGCTGGTGA
AAGTAAAAGATGCTGAAGATCAGTTGGGTGCACGAGTGGGTTACAT
CGAACTGGATCTCAACAGCGGTAAGATCCTTGAGAGTTTTCGCCCC
GAAGAACGTTCTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTG
GCGCGGTATTATCCCGTGTTGACGCCGGGCAAGAGCAACTCGGTCG
CCGCATACACTATTCTCAGAATGACTTGGTTGAGTACTCACCAGTC
ACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGAATTATGCA
GTGCTGCCATAACCATGAGTGATAACACTGCGGCCAACTTACTTCT
GACAACGATCGGAGGACCGAAGGAGCTAACCGCTTTTTTGCACAAC
ATGGGGGATCATGTAACTCGCCTTGATCGTTGGGAACCGGAGCTGA
ATGAAGCCATACCAAACGACGAGCGTGACACCACGATGCCTGTAGC
AATGGCAACAACGTTGCGCAAACTATTAACTGGCGAACTACTTACT
CTAGCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAG
TTGCAGGACCACTTCTGCGCTCGGCCCTTCCGGCTGGCTGGTTTAT
TGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTCGCGGTATCATT
GCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCT
ACACGACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGAT
CGCTGAGATAGGTGCCTCACTGATTAAGCATTGGTAACTGTCAGAC
CAAGTTTACTCATATATACTTTAGATTGATTTACCCCGGTTGATAA
TCAGAAAAGCCCCAAAAACAGGAAGATTGTATAAGCAAATATTTAA
ATTGTAAACGTTAATATTTTGTTAAAATTCGCGTTAAATTTTTGTT
AAATCAGCTCATTTTTTAACCAATAGGCCGAAATCGGCAAAATCCC
TTATAAATCAAAAGAATAGCCCGAGATAGGGTTGAGTGTTGTTCCA
GTTTGGAACAAGAGTCCACTATTAAAGAACGTGGACTCCAACGTCA
AAGGGCGAAAAACCGTCTATCAGGGCGATGGCCCACTACGTGAACC
ATCACCCAAATCAAGTTTTTTGGGGTCGAGGTGCCGTAAAGCACTA
AATCGGAACCCTAAAGGGAGCCCCCGATTTAGAGCTTGACGGGGAA
AGCGAACGTGGCGAGAAAGGAAGGGAAGAAAGCGAAAGGAGCGGGC
GCTAGGGCGCTGGCAAGTGTAGCGGTCACGCTGCGCGTAACCACCA
CACCCGCCGCGCTTAATGCGCCGCTACAGGGCGCGTAAAAGGATCT
AGGTGAAGATCCTTTTTGATAATCTCATGACCAAAATCCCTTAACG
TGAGTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAA
GGATCTTCTTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGC
AAACAAAAAAACCACCGCTACCAGCGGTGGTTTGTTTGCCGGATCA
AGAGCTACCAACTCTTTTTCCGAAGGTAACTGGCTTCAGCAGAGCG
CAGATACCAAATACTGTTCTTCTAGTGTAGCCGTAGTTAGGCCACC
ACTTCAAGAACTCTGTAGCACCGCCTACATACCTCGCTCTGCTAAT
CCTGTTAC

FIG. 28-2

CAGTGGCTGCTGCCAGTGGCGATAAGTCGTGTCTTACCGGGTTGGA
CTCAAGACGATAGTTACCGGATAAGGCGCAGCGGTCGGGCTGAACG
GGGGGTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCG
AACTGAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCC
CGAAGGGAGAAAGGCGGACAGGTATCCGGTAAGCGGCAGGGTCGGA
ACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAACGCCTGGTATC
TTTATAGTCCTGTCGGGTTTCGCCACCTCTGACTTGAGCGTCGATT
TTTGTGATGCTCGTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGC
AACGCGGCCTTTTTACGGTTCCTGGCCTTTTGCTGGCCTTTTGCTC
ACATGTAATGTGAGTTAGCTCACTCATTAGGCACCCCAGGCTTTAC
ACTTTATGCTTCCGGCTCGTATGTTGTGTGGAATTGTGAGCGGATA
ACAATTTCACACAGGAAACAGCTATGACCATGATTACGCCAAGCTA
CGTAATACGACTCACTAGTGGGCAGATCTTCGAATGCATCGCGCGC
AATTCACCGCCGTATGGCTGACCGGCGATTACTAGCGATTCCGGCT
TCATGCAGGCGAGTTGCAGCCTGCAATCCGAACTGAGGACGGGTTT
TTGGGGTTAGCTCACCCTCGCGGGATCGCGACCCTTTGTCCCGGCC
ATTGTAGCACGTGTGTCGCCCAGGGCATAAGGGGCATGATGACTTG
ACGTCATCCTCACCTTCCTCCGGCTTATCACCGGCAGTCTGTTCAG
GGTTCCAAACTCAACGATGGCAACTAAACACGAGGGTTGCGCTCGT
TGCGGGACTTAACCCAACACCTTACGGCACGAGCTGACGACAGCCA
TGCACCACCTGTGTCCGCGTTCCCGAAGGCACCCCTCTCTTTCAAG
AGGATTCGCGGCATGTCAAGCCCTGGTAAGGTTCTTCGCTTTGCAT
CGAATTAAACCACATGCTCCACCGCTTGTGCGGGCCCCCGTCAATT
CCTTTGAGTTTCATTCTTGCGAACGTACTCCCCAGGCGGGATACTT
AACGCGTTAGCTACAGCACTGCACGGGTCGATACGCACAGCGCCTA
GTATCCATCGTTTACGGCTAGGACTACTGGGGTATCTAATCCCATT
CGCTCCCCTAGCTTTCGTCTCTCAGTGTCAGTGTCGGCCCAGCAGA
GTGCTTTCGCCGTTGGTGTTCTTTCCGATCTCTACGCATTTCACCG
CTCCACCGGAAATTCCCTCTGCCCCTACCGTACTCCAGCTTGGTAG
TTTCCACCGCCTGTCCAGGGTTGAGCCCTGGGATTTGACGGCGGAC
TTAAAAAGCCACCTACAGACGCTTTACGCCCAATCATTCCGGATAA
CGCTTGCATCCTCTGTATTACCGCGGCTGCTGGCACAGAGTTAGCC
GATGCTTATTCCCCAGATACCGTCATTGCTTCTTCTCCGGGAAAAG
AAGTTCACGACCCGTGGGCCTTCTACCTCCACGCGGCATTGCTCCG
TCAGCTTTCGCCCATTGCGGAAAATTCCCCACTGCTGCCTCCCGTA
GGAGTCTGGGCCGTGTCTCAGTCCCAGTGTGGCTGATCATCCTCTC
GGACCAGCTACTGATCATCGCCTTGGTAAGCTATTGCCTCACCAAC
TAGCTAATCAGACGCGAGCCCCTCCTCGGGCGGATTCCTCCTTTTG
CTCCTCAGCCTACGGGGTATTAGCAGCCGTTTCCAGCTGTTGTTCC
CCTCCCAAGGGCAGGTTCTTACGCGTTACTCACCCGTCCGCCACTG
GAAACACCACTTCCCGTCCGACTTGCATGTGTTAAGC

FIG. 28-3

ATGCCGCCAGCGTTCATCCTGAGCCAGGATCGAACTCTCCATGAGAT
TCATAGTTGCATTACTTATAGCTTCCTTGTTCGTAGACAAAGCGGAT
TCGGAATTGTCTTTCATTCCAAGGCATAACTTGTATCCATGCGCTTC
ATATTCGCCCGGAGTTCGCTCCCAGAAATATAGCCATCCCTGCCCCC
TCACGTCAATCCCACGAGCCTCTTATCCATTCTCATTGAACGACGGC
GGGGGAGCAAATCCAACTAGAAAAACTCACATTGGGCTTAGGGATAA
TCAGGCTCGAACTGATGACTTCCACCACGTCAAGGTGACACTCTACC
GCTGAGTTATATCCCTTCCCCGCCCCATCGAGAAATAGAACTGACTA
ATCCTAAGTCAAAGGCGTACGagaatactcaatCATGAATAAATGCA
AGAAAATAACCTCTCCTTCTTTTTCTATAATGTAAACAAAAAAGTCT
ATGTAAGTAAAATACTAGTAAATAAATAAAAAGAAAAAAAGAAAGGA
GCAATAGCACCCTCTTGATAGAACAAGAAAATGATTATTGCTCCTTT
CTTTTCAAAACCTCCTATAGACTAGGCCAGGATCCTCGAGcttaatt
aaGGTAAAATCTTGGTTTATTTAATCATCAGGGACTCCCAAGCACAC
TAGTTTTCTACAAATCAAAATAGAAAATAGAAAATGGAAGGCTTTTT
ATTCAACAGTATAACATGACTTATATACTCGTGTCAACCAAGGTGTA
TGTAGATCtattcCTGCAGGATATCTGGATCCACGAAGCTTCCCATG
GGAATAGATCTACATACACCTTGGTTGACACGAGTATATAAGTCATG
TTATACTGTTGAATAAAAAGCCTTCCATTTTCTATTTTGATTTGTAG
AAAACTAGTGTGCTTGGGAGTCCCTGATGATTAAATAAACCAAGATT
TTACCGTTTAAACACCGGTGATCCTGGCCTAGTCTATAGGAGGTTTT
GAAAAGAAAGGAGCAATAATCATTTTCTTGTTCTATCAAGAGGGTGC
TATTGCTCCTTTCTTTTTTTCTTTTTATTTATTTACTAGTATTTTAC
TTACATAGACTTTTTTGTTTACATTATAGAAAAAGAAGGAGAGGTTA
TTTTCTTGCATTTATTCATGATTGAGTATTCTcctaggGTCGAGAAA
CTCAACGCCACTATTCTTGAACAACTTGGAGCCGGGCCTTCTTTTCG
CACTATTACGGATATGAAAATAATGGTCAAAATCGGATTCAATTGTC
AACTGCCCCTATCGGAAATAGGATTGACTACCGATTCCGAAGGAACT
GGAGTTACATCTCTTTTCCATTCAAGAGTTCTTATGCGTTTCCACGC
CCCTTTGAGACCCCGAAAAATGGACAAATTCCTTTTCTTAGGAACAC
ATACAAGATTCGTCACTACAAAAAGGATAATGGTAACCCTACCATTA
ACTACTTCATTTATGAATTTCATAGTAATAGAAATACATGTCCTACC
GAGACAGAATTTGGAACTTGCTATCCTCTTGCCTAGCAGGCAAAGAT
TTACCTCCGTGGAAAGGATGATTCATTCGGATCGACATGAGAGTCCA
ACTACATTGCCAGAATCCATGTTGTATATTTGAAAGAGGTTGACCTC
CTTGCTTCTCTCATGGTACACTCCTCTTCCCGCCGAGCCCCTTTTCT
CCTCGGTCCACAGAGACAAAATGTAGGACTGGTGCCAACAATTCATC
AGACTCACTAAGTCGGGATCACTAACTAATACTAATCTAATATAATA
GTCTAATATATCTAATATAATAGAAAATACTAATATAATAGAAAAGA
ACTGTCTTTTCTGTATACTTTCCCCGGTTCCGTTGCTACCGCGGGCT
TTACGCAATCGATCGGATTAGATAGATATCCCTTCAACATAGGTCAT
CGA

FIG. 28-4

AAGGATCTCGGAGACCCACCAAAGTACGAAAGCCAGGATCTTTCAG
AAAACGGATTCCTATTCAAAGAGTGCATAACCGCATGGATAAGCTC
ACACTAACCCGTCAATTTGGGATCCAAATTCGAGATTTTCCTTGGG
AGGTATCGGGAAGGATTTGGAATGGAATAATATCGATTCATACAGA
AGAAAAGGTTCTCTATTGATTCAAACACTGTACCTAACCTATGGGA
TAGGGATCGAGGAAGGGGAAAAACCGAAGATTTCACATGGTACTTT
TATCAATCTGATTTATTTCGTACCTTTCGTTCAATGAGAAAATGGG
TCAAATTCTACAGGATCAAACCTATGGGACTTAAGGAATGATATAA
AAAAAAGAGAGGGAAAATATTCATATTAAATAAATATGAAGTAGAA
GAACCCAGATTCCAAATGAACAAATTCAAACTTGAAAAGGATCTTC
CTTATTCTTGAAGAATGAGGGGCAAAGGGATTGATCAAGAAAGATC
TTTTGTTCTTCTTATATATAAGATCGTGATGGTACCCTCTAGTCAA
GGCCTTAAGTGAGTCGTATTACGGACTGGCCGTCGTTTTACAACGT
CGTGACTGGGAAAACCCTGGCGTTACCCAACTTAATCGCCTTGCAG
CACATCCCCCTTTCGCCAGCTGGCGTAATAGCGAAGAGGCCCGCAC
CGATCGCCCTTCCCAACAGTTGCGCAGCCTGAATGGCGAATGGCGC
TTCGCTTGGTAATAAAGCCCGCTTCGGCGGGCTTTTTTTT